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Real Wages in Canada: The Stylized Facts

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1 Introduction and Summary

This note focuses on the historical pattern of real wage movements in Canada over the past two decades. Particular emphasis is placed on trends and cycles in the data. In the next section, some of the literature on the cyclical movements of the real wage is summarized. Following this, the question of the definition of various real wage proxies is addressed. Finally, I present the data in both a numerical and graphical form and discuss their salient features.

2 Literature on the Cyclical Movements of the Real Wage

The literature on the real wage-(un)employment relationship is quite expansive. One early, widely accepted view (incorporated for example in the work of Jacques Rueff and John Maynard Keynes) held that the real wage is countercyclical because the marginal product of labour (being downward-sloping) declines with increases in output. Bodkin (1969) refers to "la Loi de Rueff": that employment and the real wage are negatively correlated. Under this hypothesis, the causation runs from employment to wages. It was not long until John Dunlop, Lorie Tarshis and others argued for a positive correlation based on relatively flat marginal cost curves, non-competitive pricing practices, price rigidity and countercyclical changes in the degree of monopoly power. In times of expansion, employment and nominal wages increase, while other costs do not and prices are slow to react owing to reductions in price-cost margins. In Bodkin's (1969) regression analysis of quarterly Canadian data from 1949 to 1965 and annual Canadian data from 1921 to 1965 he found no significant effect of the official unemployment rate on CPI -- deflated, trend-free average hourly earnings for manufacturing production workers. If U.S. data are used to estimate a trend-free real wage equation, the unemployment rate effect is found to be pro-cyclical in most cases, but significantly countercyclical when the deflation of the wage series is undertaken using the wholesale price index for manufacturing. Bodkin also mentioned the possibility of feedback from wages to (un)employment but claimed that his unreported two-stage least squares estimation results led to similar conclusions. Such an estimation using annual U.S. data from 1930 to 1965 was reported by Lucas and Rapping (1969) who found the real wage to have an insignificant positive effect on employment, while real output growth

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as well as lagged employment had significant negative effects on the real wage. Agarwala et al. (1972) found the inverse of the unemployment rate to take a significant positive coefficient in a Canadian real consumption wage equation estimated with annual data from 1950 to 1968, controlling for real GNE per employee and a unionization variable. Canzoneri (1978) estimated a production function as well as a real wage equation using quarterly Canadian data for the 1954-70 period. He found a significant negative coefficient in the latter on the labour/capital ratio, which led him to conclude that real wages are countercyclical given short-run capital fixity. Otani (1978) estimated simple regressions of real wage growth against industrial output in the manufacturing sector of 14 developed countries. Of the 11 slope estimates that were negative, 6 were significantly so. The estimates for Canada were insignificantly negative, but there was evidence of serial correlation and therefore a probable error resulting from an omitted variable. Neftci (1978) used time-series methods on monthly U.S. data for the 1948-71 period and found no effect of employment on real wages as well as a significant positive contemporaneous effect and a significant negative long-run effect of real wages on employment. Kirkpatrick (1981) also used Granger-Sims techniques on this relationship for U.S. blue-collar manufacturing employees for the 1948-77 period. He attributed the clarity of Neftci's conclusion of countercyclicality and unidirectional causality (from the real wage to employment) to his inappropriate use of a consumer price index to arrive at a real wage. Using the WPI for manufacturing he usually concluded that producer real wages reduce employment without feedback; i.e., countercyclicality but in the opposite direction. Similar results were obtained by the OECD (1982) for the 1961-80 period for its 20 member countries, but the significance of those results is quite weak except in the cases of Canada, Denmark, Austria, Portugal, Spain and Switzerland. Geary and Kennan (1982) examined quarterly manufacturing data for 12 OECD countries and concluded that one cannot clearly reject the hypothesis of cyclical independence of real wages and employment, especially for the United States, Canada, Belgium and West Germany. However, they refer to unpublished research by Kennan for nine, two-digit Canadian industries in which three of the nine exhibited a significant positive contemporaneous correlation. Finally, McClam and Andersen (1983) estimated real wage growth equations for the manufacturing sector for Austria, Belgium, Canada and Sweden, controlling for unexpected inflation, productivity growth, the terms of trade and, for Canada, the effects of the Anti-Inflation Board. They found the estimated coefficient on the unemployment rate to be negative in all four cases and significant for all except Sweden.

3 Some Definitions of the Real Wage

There is no single optimal measure of the real wage for Canada or for any other country. A variety of nominal wage measures may be combined

with a variety of deflators.[1] Some are on a weekly basis, while others are on an hourly basis. The latter have an a priori advantage since average weekly hours vary both cyclically and secularly. However, the hourly data are available for a sufficiently long period for analysis only for manufacturing and mining industries where the cyclical element is more extreme and the average level is much greater than in other sectors.

To this point, only the relevant variables stored in the database of RDXF, a quarterly econometric model of the Canadian economy developed at the Bank of Canada, have been used to investigate the stylized facts about the performance of real wages. The advantage of using these wage data is that they provide as comprehensive and consistent a wage measure as is available for the Canadian economy over an extended period. As approximations to a pure real wage rate, however, they do suffer from the usual weaknesses in that they are affected by inter-industry and occupational shifts, lump sum payments and strike-related losses. Other possible data sources for wage measures are the large establishment survey and wage settlements, but these are significantly less comprehensive. The limited availability of wage data restricts the sample period for analysis to 1961-83, although two variables for real labour income (including supplementary labour income and special payments but excluding losses due to strikes) per paid employee have been constructed in order to extend the sample back to 1953. The definitions of the "real wage" variables are given in Table 1.

The measures are distinguished by which deflator has been used to render the nominal variable a real proxy. We have used four different price series for this purpose. Two are consumption-basket price deflators, one is the gross-private-business-product price deflator (which is available beginning only in 1961) and the last is the gross national expenditure deflator. The consumer price index (CPI) and the consumer expenditure deflator are the more appropriate deflators when one wishes to examine the data from a labour supply point of view, while the others are preferred from a labour demand vantage point. Workers are presumably concerned with the basket of goods they can buy with their wages, while employers are limited by their ability to pay; that is, the cost of labour relative to the price employers receive for their output. In times of disequilibrium in the labour market, wages may tend to follow one deflator more than the other; specifically, if labour is in excess demand, the consumer-price-deflated wage (the real consumption wage) might dominate and, conversely, when in excess supply, the producer-price-deflated proxy (the real product wage) would possibly do so.

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1. Debate over the appropriate deflator has a very long history. Ruggles (1940) was the first to argue that an output (rather than a consumer) price deflator should be used. But it is clear that one would like the deflator to pertain at most to the value-added portion of the output and not include imported and other input costs as does the wholesale price index.

4 The Data

4.1 The secular patterns

The data are presented in Table 2 in the form of collapsed annual percentage changes. By collapsing the series to an annual frequency we are removing much of the noise from the series so that the patterns will be more evident. We express them in percentage change form in order to remove the simple trend. A correlation matrix for the years 1962 to 1983 is given in Table 3. We observe very high degrees of correlation among the proxies but the correlation coefficients are noticeably lower between pairs deflated by different kinds of price deflators. We see, however, that all the proxies tell a similar secular story: real wages grew rapidly from 1960 until the end of 1976 (1973 in the case of producer-price-deflated wages, given the large, favourable shift in the terms of trade in 1974-75), after which growth either slowed down and eventually disappeared -- for the residual non-commercial sector (not shown here) -- or turned negative for a time, before bottoming out around the end of 1980 (when on an hourly basis) or at the trough of the recent recession (when on a weekly basis). Only in 1958-59, just after a mild recession, was there any other substantial slowdown in real wage growth. Since average weekly hours worked in manufacturing and mining declined secularly from 1966 to 1974, those proxies on an hourly basis exhibit stronger growth over that period.

If one compares the real wage proxies derived by using the consumer expenditure deflator with those derived by using the CPI, one finds that the former manifest stronger growth in general. This is because the use of fixed weights in the construction of the CPI keeps it higher than a measure (such as the consumer expenditure deflator) that includes substitution effects. If these series are compared with those deflated using the gross-private-business-product deflator, one observes that the real product wage grew more rapidly until about 1972 (the end of a period of secular declines in Canada's terms of trade) and then less rapidly (as the terms of trade generally improved). In 1983 the increase in the industrial composite nominal wage exceeded that of the residual sector for the first time since the beginning of the analysis. Over the period supplementary labour income has grown much more quickly than other forms of labour income. For these reasons one sees clearly higher growth rates when one looks at economy-wide data.

4.2 The cyclical influences

In this section I distinguish between periods of growth and recession, including as recessions the two periods of growth slowdown in the 1960s.

a) Real wages using consumer prices

i) Industrial composite real wages

Graph 1 illustrates the patterns of annual growth in WA, WB, WC and WD, all of which use consumer prices in deflation. The latter two are in hourly terms, while the first two are on a weekly basis. Periods of recession are indicated by shaded areas. It is clear that the largest change in the rate of growth of real wages occurred after 1976 (as we observed previously) and that this was not a period of especially slow economic growth. Rather, this decline was probably due to the widely cited slowdown in labour (and total factor) productivity growth as well as the precipitous decline in the value of the Canadian dollar and the cumulative impact of the Anti-Inflation Board. There is some weak negative effect on real wage growth from the 1966-67 and 1970 slowdowns and perhaps from the recent recession, but the largest declines appear to occur during expansions in accord with la Loi de Rueff. It appears to make little difference whether the proxy is on an hourly or a weekly basis; this is not surprising since annual changes in hours worked are typically fairly small.

ii) Aggregate economy real wages

Graph 2 presents the percentage change in the three measures of real wages for the aggregate economy (deflated by consumer prices). WE and WF include only wage income. WG also includes other forms of labour income, and as before, its growth is therefore somewhat greater on average. The 1957 recession had a clear negative impact on WG, but otherwise it appears that downward changes in growth rates occurred during economic expansions as well as in 1977-78 in the face of the confluence of the AIB, the productivity slowdown and the exchange rate depreciation.

b) Real wages using producer prices

i) Industrial composite real wages

Industrial composite real wage growth using producer-price deflators is given in Graph 3. WH is on a weekly basis, while WI is on an hourly basis. This time the largest deceleration in real wages occurs from 1971-74, although there is still a very large slowdown in 1977-79. Both are clearly periods of expansion. However, there appear to be pro-cyclical tendencies in the data: witness the slowdowns in 1967, 1970 and 1974 as well as the accelerations in 1965, 1968-69, 1971, 1975-76 and 1981.

ii) Aggregate economy real wages

Finally, we turn to aggregate economy real wage growth defined with producer-price deflators as depicted in Graph 4. WJ is limited to wage

income, while WK includes all labour income. It should be noted that WJ usually exceeds WK, especially prior to 1974, owing to the different patterns of the deflators. The GNE deflator -- used in WK -- showed much stronger growth than the gross-private-business-product deflator until the early 1970s. In general, the cyclical pattern is fairly similar to that of producer-price-deflated, industrial composite real wage growth. The two largest decelerations occurred in periods of expansion, but there is evidence of pro-cyclicality in many other years.

5 Conclusions

Evidence of cyclicality of real wages in Canada is quite unclear from a simple, visual examination of the data. The largest decelerations in real wages occurred in 1971-74 (especially for real product wages) and 1977-79, both periods of fairly healthy expansion. Other periods appear to conform more strongly to a pro-cyclical pattern, but only in the case of real product wages. Care should be taken, however, not to regard these conclusions as definitive, since other influences on real wages such as productivity, factor proportions, price/inflation-expectation errors, taxes and other income deductions, the AIB and industry structure were not controlled for. In addition, the dynamics of the process of real wage formation have been totally neglected.

Table 1

Variable Descriptions

Identifier	RDXF Description	
A.	Consumer-Price-Deflated Proxies	
WA	WNIC/PCPI	Average weekly wage in industrial composite ÷ CPI
WB	WNIC/PCON	Average weekly wage in industrial composite ÷ consumer expenditure deflator
WC	(WNIC/HAWMM)/PCPI	WA deflated by average weekly hours in manufacturing and mining
WD	(WNIC/HAWMM)/PCON	WB deflated by average weekly hours in manufacturing and mining
WE	((WNIC*NIC+WOTH*NOTH)/(NIC+NOTH))/PCPI	Weighted average weekly wage ÷ CPI
WF	((WNIC*NIC+NOTH*NOTH)/(NIC+NOTH))/PCON	Weighted average weekly wage ÷ consumer expenditure deflator
WG	(YW/NEPD)/PCON	Labour income per paid employee ÷ consumer expenditure deflator
B.	Producer-Price-Deflated Proxies	
WH	WNIC/PGPP	Average weekly wage in industrial composite ÷ price of gross private business product
WI	(WNIC/HAWMM)/PGPP	WC deflated by average weekly hours in manufacturing and mining
WJ	((WNIC*NIC+WOTH*NOTH)/(NIC+NOTH))/PGPP	Weighted average weekly wage ÷ price of gross private business product
WK	(YW/NEPD)/PGNE	Labour income per paid employee ÷ GNE deflator

Table 2

Annual Change in Real Wages (%)

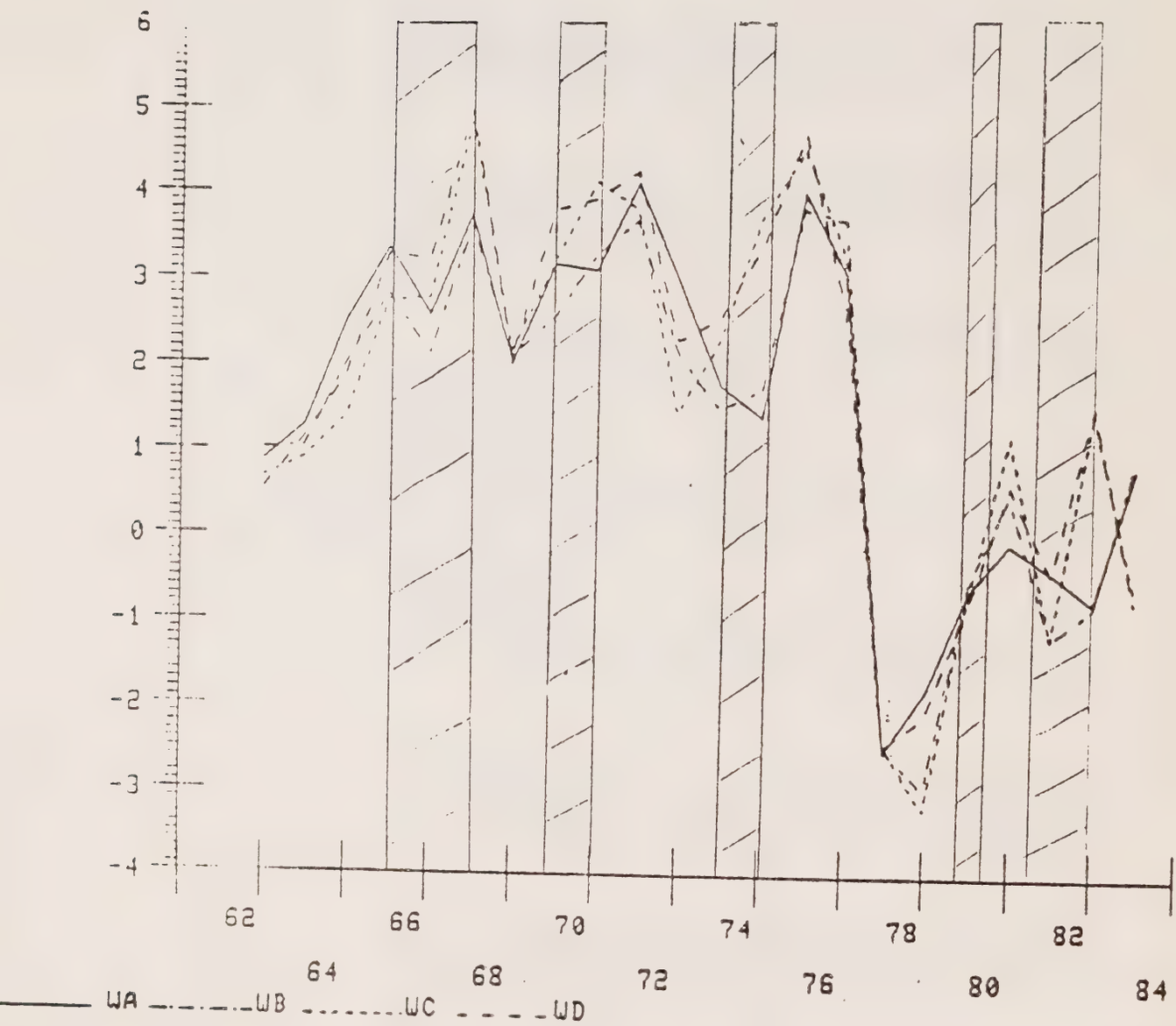
WA	WB	WC	WD	WE	WF	WG	WH	WI	WJ	UK
						1.444894				0.813795
						2.415038				1.875888
						4.420631				2.418682
						1.567455				2.539034
						-0.431070				0.740696
						1.567362				0.628393
						1.941654				1.689391
						2.088619				2.245808
0.881706	1.012887	0.678896	0.547246	1.554777	1.422752	1.845189	5.285932	4.936115	5.850553	1.822765
1.293007	1.052524	0.910158	1.150537	1.341496	1.582789	2.047708	1.617393	1.477249	1.908235	1.695844
2.508532	2.025468	1.404069	1.884013	2.372169	2.856977	3.206818	0.696189	0.080387	1.037510	2.021015
3.361218	2.833323	2.761465	3.288820	2.944922	3.473365	3.492703	3.079447	3.009493	3.192520	2.198401
2.588152	2.139371	2.789191	3.241015	2.852647	3.304400	3.472367	3.774857	4.433508	4.498592	2.336987
3.750473	3.603848	4.852939	5.001223	3.991020	4.138255	3.537163	1.763188	2.991043	2.143765	3.022081
2.031283	2.112576	2.180629	2.099759	2.287188	2.205729	1.605761	3.851210	3.922334	4.028680	2.505243
3.179346	2.572902	3.207373	3.817920	3.004106	3.613567	4.108795	4.587375	5.235083	5.030051	3.599553
3.104642	3.297509	4.153963	3.958678	3.495991	3.302365	2.709106	1.074331	1.907569	1.266831	1.561763
4.122943	3.693661	3.841777	4.269134	4.093479	4.524956	5.091636	5.342759	5.494116	5.748162	4.305108
2.998322	2.163478	1.470062	2.301129	2.542795	3.380245	3.557172	3.140309	2.442142	3.522863	2.546529
1.790904	1.522549	2.316691	2.587708	1.808322	2.077417	2.065843	1.240575	2.030087	1.523918	0.385763
1.419052	1.752515	3.763010	3.420985	2.283542	1.947861	3.326016	-2.720625	-0.803489	-2.212984	-0.293905
4.043338	3.860532	4.548946	4.734601	3.896776	4.079201	3.531083	0.866744	1.543844	0.903628	3.353171
3.108979	3.719226	3.328071	2.720628	4.527194	3.912400	5.923719	3.190949	2.799883	3.992631	4.513847
-2.477252	-2.424202	-2.372125	-2.425311	-0.483572	-0.536701	0.674083	-1.611357	-1.558484	0.348812	1.266432
-1.785519	-2.907088	-3.180051	-2.063246	-2.184075	-1.054135	-1.516842	-0.366410	-0.648865	0.374774	-0.593357
-0.624212	-0.543612	-0.712213	-0.791516	-0.499151	-0.580630	-1.090358	-3.194011	-3.360896	-3.152705	-2.018070
-0.041300	0.531266	1.210370	0.634012	0.574920	0.002642	-1.249283	-2.361784	-1.698007	-2.316084	-1.574277
-0.379413	-1.151432	-1.159887	-0.385611	-0.889505	-0.115379	0.524627	2.764419	2.756629	3.035008	1.412652
-0.737666	-0.778088	1.535247	1.573501	-0.140149	-0.100022	0.581683	1.585744	3.958757	2.239956	1.200627
0.838623	0.943765	-0.610741	-0.713264	0.680118	0.575582	-0.802856	0.245367	-1.307840	-0.017686	-0.654249

Table 3

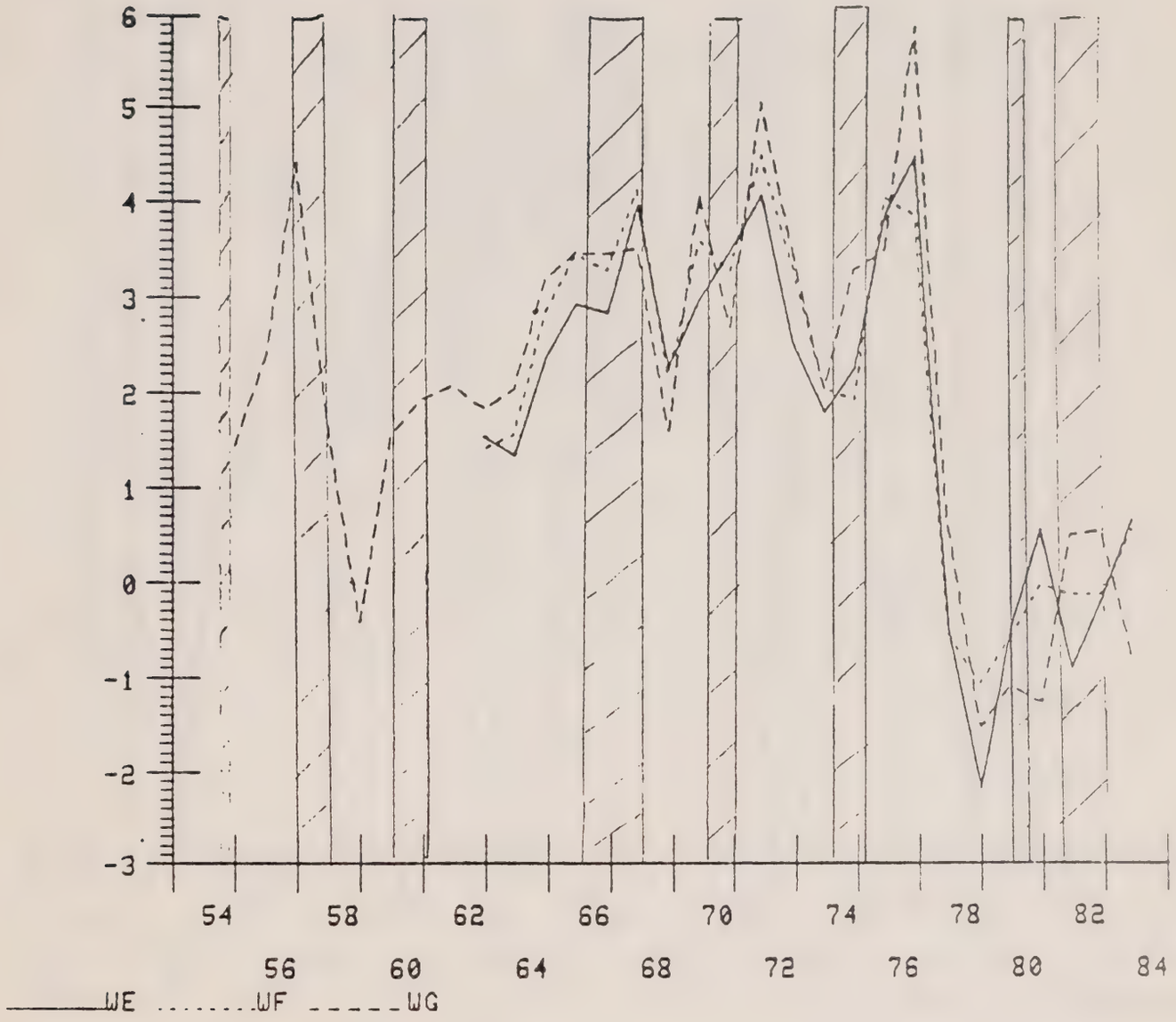
Correlation Matrix Between Real Wage Measures (1962-83)

	WA	WB	WC	WD	WE	WF	WG	WH	WI	WJ
WA	1.00000									
WB	0.973570	1.00000								
WC	0.875968	0.918215	1.00000							
WD	0.912297	0.908070	0.979411	1.00000						
WE	0.946860	0.976280	0.913102	0.900479	1.00000					
WF	0.975436	0.948130	0.868266	0.905528	0.969553	1.00000				
WG	0.836636	0.817178	0.776281	0.805582	0.895867	0.918796	1.00000			
WH	0.549744	0.465359	0.348511	0.428381	0.487879	0.579304	0.584865	1.00000		
WI	0.556470	0.488928	0.508453	0.577815	0.525208	0.598824	0.625295	0.938720	1.00000	
WJ	0.475001	0.392030	0.293890	0.371895	0.450323	0.540880	0.594792	0.984936	0.932886	1.00000
WK	0.705945	0.654521	0.578407	0.632963	0.741939	0.799304	0.860826	0.786066	0.780439	0.809965

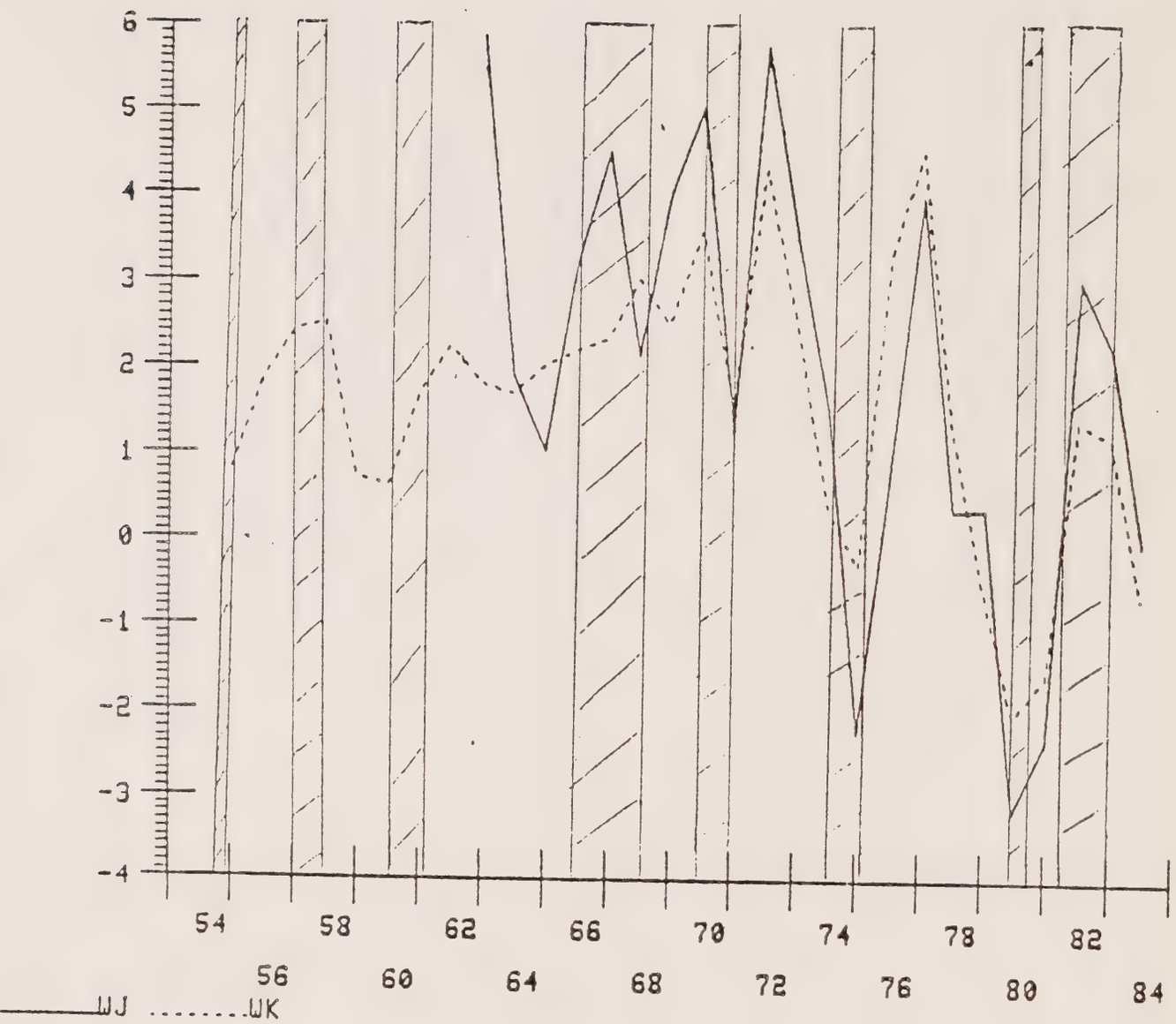
GRAPH 1 - Real Wages Using Consumer Prices
(Industrial Composite)



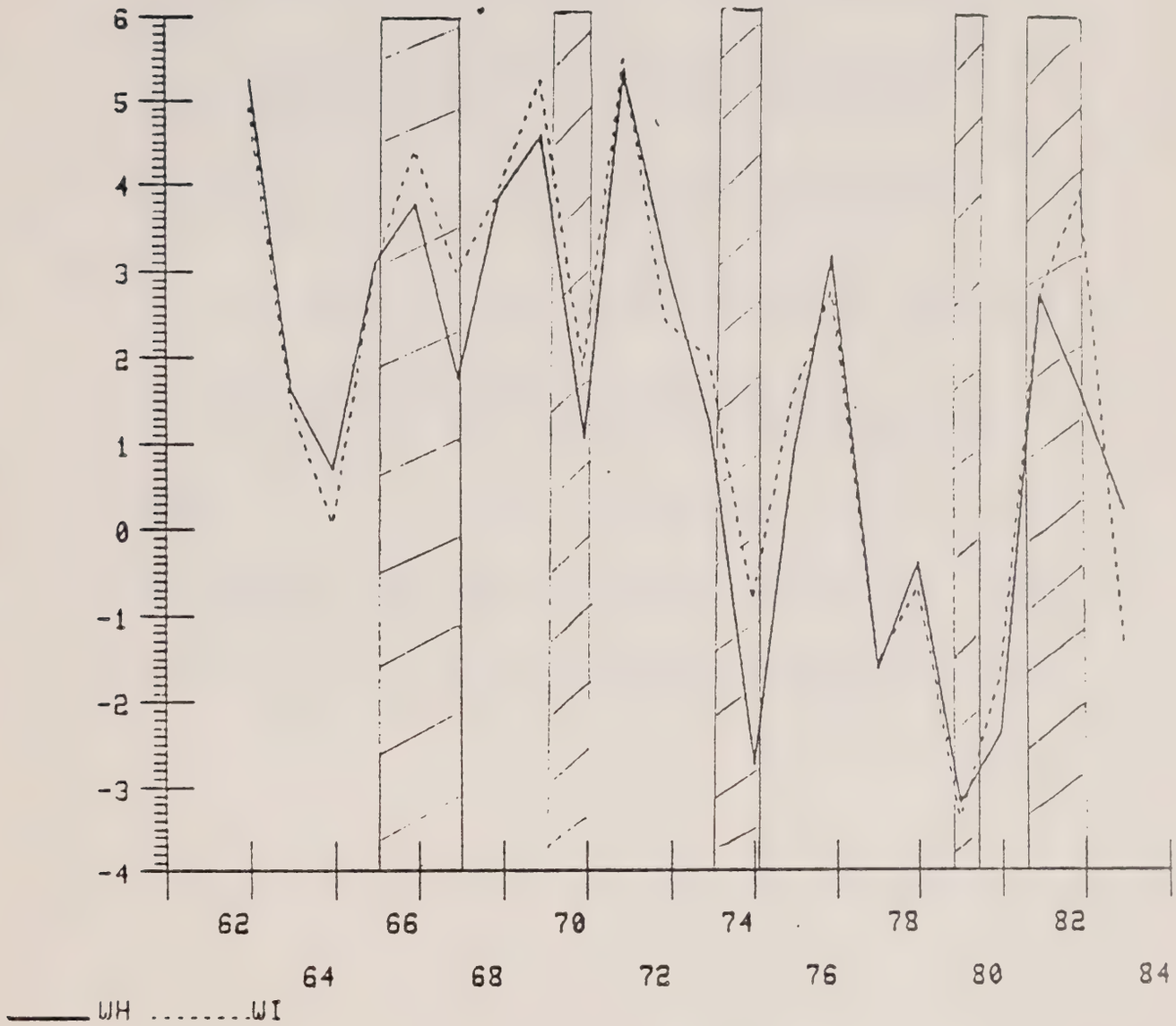
GRAPH 2 - Real Wages Using Consumer Prices
(Aggregate Economy)



GRAPH 3 - Real Wages Using Producer Prices
(Industrial Composite)



GRAPH 4 - Real Wages Using Producer Prices
(Aggregate Economy)



REFERENCES

Agarwala, R. et al. (1972). "A Neo-classical Approach to the Determination of Prices and Wages." Economica, XXXIX, 155, August, pp. 250-263.

Bodkin, Ronald G. (1969). "Real Wages and Cyclical Variations in Employment." Canadian Journal of Economics, II, 3, August, pp. 353-374.

Canzoneri, Matthew B. (1978). "The Returns to Labor and the Cyclical Behavior of Real Wages: The Canadian Case." Review of Economics and Statistics, LX, 1, February, pp. 19-24.

Geary, Patrick T. and John Kennan (1982). "The Employment-Real Wage Relationship: An International Study." Journal of Political Economy, 86, 2, part 1, pp. 281-291.

Kirkpatrick, Grant (1981). "Further Results on the Time Series Analysis of Real Wages and Employment for U.S. Manufacturing, 1948-1977." Weltwirtschaftliches Archiv, 117, 2, pp. 326-359.

Lucas, Robert E., Jr. and Leonard A. Rapping (1969). "Real Wages, Employment, and Inflation." Journal of Political Economy, 77,5, September-October, pp. 721-754.

McClam, W.D. and P.S. Andersen (1983). "Adjustment Performance of Open Economies: Some International Comparisons." Bank for International Settlements, December.

Neftci, Salih N. (1978). "A Time-Series Analysis of the Real Wages-Employment Relationship." Journal of Political Economy, 86, 2, part 1, pp. 281-291.

OECD Secretariat (1982). "Real Wages and Employment." DES/WP1/EM (82) 2, March.

Otani, Ichiro (1978). "Real Wages and Business Cycles Revisited." Review of Economics and Statistics, LX, 2, May, pp. 301-304.

Ruggles, Richard (1940). "The Relative Movements of Real and Money Wage Rates." Quarterly Journal of Economics, pp. 130-149.